

Bulk and Surface Electronic Structure of Sr_2RuO_4

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The electronic structure of Sr_2RuO_4 is investigated by high-resolution angle-resolved photoemission spectroscopy (ARPES). We address the controversial issue of the Fermi surface (FS) topology, showing that a $\sqrt{2} \times \sqrt{2}$ surface reconstruction (as confirmed by LEED) and, in particular, the detection of surface bands are responsible for previous conflicting interpretations. By cleaving the samples at different temperatures and varying the incident photon energy, we could separate the bulk from the surface electronic structure, concluding that the bulk FS as determined by ARPES is consistent with LDA and de Haas-van Alphen results and provides direct information on the exact shape of the different sheets.* Furthermore, by comparing the surface electronic structure with band structure calculations for a reconstructed/ferromagnetic surface, we could test the hypothesis of surface ferromagnetism in Sr_2RuO_4 , which may have significant ramifications for determining the mechanism of superconductivity in the bulk. This way, we could conclude that the ARPES data are most readily explained by the $\sqrt{2} \times \sqrt{2}$ surface reconstruction, with no evidence for surface ferromagnetism.†

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